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Review

A comprehensive review of recent advances in research on COVID in communication studies

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Abstract

Background The COVID-19 pandemic initiated a great global crisis, during which media influenced society and social interactions affected media use. Researchers from various research fields have studied the pandemic both globally and locally. This study aims to summarize the research on COVID-19 pandemic within communication studies, taking into account 358 articles published in SJR best ranked journals in 2020–2022.

Methods The study uses both qualitative and quantitative methods. Using manual coding and qualitative content analysis, we investigate articles' distribution according to journals, time, accessibility (either open, free or restricted) and methodological approaches. We also provide a qualitative summary of trending research themes. Using quantitative social network analysis (SNA) we present the distribution of institutions and countries in articles' affiliations, and the collaboration network at institutional and country level.

Results Results show an in-time increase of COVID-related publications. Articles were affiliated with 490 institutions from 68 countries, with the USA having the greatest representation. There was an underrepresentation of African and South American countries, which reflects the core-periphery challenge in knowledge production. The network analysis revealed that very few of possible connections were actually achieved. There is an observable trend of using quantitative methods. A growth on the gap between qualitative and quantitative studies was observed each year. More than a half of articles using qualitative methods were published in restricted access. Our qualitative summary of the addressed topics and main findings in articles related to COVID-19, media and society revealed a wide research interest in pandemics impacts on news consumption, media use and journalism, as well as infodemic, conspiracy narratives, science mistrust and discrimination and inequalities increased by the pandemic.

Conclusion To provide a wider perspective on the worldwide impact of pandemic, more studies from underrepresented countries are needed. The collaboration between institutions and countries requires strengthening. Qualitative studies were conducted considerably less than quantitative studies and they were usually published in restricted access, which leads to a methodological gap.

Keywords Media consumption · Core-periphery knowledge production · Open access · Scimago Journal Rank (SJR) · Trends in research · Communication studies · COVID-19 · Social network analysis · Mixed-methods review · Qualitative summary

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1 Introduction

The COVID-19 pandemic affected various aspects of life and thus generated significant academic interest: research has been funded and conducted across a diverse range of disciplines. COVID-19 became an instant focal point on studies related to epidemiology [1], public health [2], economics [3] and communication [4]. Pandemic also affected research production and publication dynamics [5].

In the face of enormous growth in scientific production [6], bibliometric has become an essential tool for assessing and analyzing researchers' production and collaboration [7, 8]. Bibliometric analysis is crucial in uncovering emerging trends in article and journal performance on the basis of extant literature [9]. The bibliometric evaluation of science reveals existing trends and gaps, which results in a better understanding of a given field and, consequently, sets directions for development and indicates areas that require a deeper inspection.

In this article we focus on a review of the literature on the COVID-19 pandemic within social sciences.

Precisely, the aim of this study is to characterize trends in research on COVID-19 pandemic conducted within communication studies. We define trends as directions of development of research on COVID in the area of communication studies, in this case observable over the course of three years (2020–2022). In particular, we focus on the popularity of this topic in individual journals, publishing in open access, and methodological approaches. Additionally, we analyze the affiliations of the authors of these studies in order to illustrate the representation of countries and continents, and to map the cooperation network. Finally, we provide a qualitative summary of articles' main findings.

Our goal was to focus on the most influential journals. Despite many efforts, so far there is no flawless and universal method for science evaluation (and in consequence: journal evaluation) on which there is a full agreement. Thus, we decided to rely on Scimago Journal Rank (SJR), considered as one of the most powerful index to rank journals [10] which does not take into account journals with self-citations above 33% [11].

This study provides an innovative approach to data collection and reviewing processes. Review articles using quantitative analyses of bibliometric data from Scopus or Web of Science are common practice. While those bases provide access to a large amount of structured information, the empirical analysis reveals their flaws, such as not indexing the papers, managing *online first* articles [12] as well as a "low level of data completeness and errors in categorizing journals, articles and authors" [13]. Due to these flaws, as pointed out by Osiński [13] "it is necessary to verify the data retrieved from the WoS and Scopus databases with qualitative methods, e.g. analysis of the thematic profile, or content, of the given authors' publications". Thus, instead of large-scale quantitative analysis of articles' data collected from databases, this study focuses on full length articles published in specific journals between years 2020 and 2022. The reviewing process includes quantitative analysis of bibliometric data and qualitative assessment based on manual coding. This approach is consistent with the assumptions of bibliometrics, the interpretations of which "often rely on both objective (e.g., performance analysis) and subjective (e.g., thematic analysis) evaluations established through informed techniques and procedures" [9].

In this literature review we have focused on four issues: distribution of articles, methodological approaches, authors' affiliations, and main findings in trending topics.

The distribution of articles was analyzed in order to point out which journals published most of the articles focused on COVID, in which years this topic was most often raised, and to what extent these articles were available free of charge. This first research scope is essential as the results depict temporal variability of interest in pandemic among journals. The presence of such topics in social science publications shows the multidimensionality of the public health issue. The issue of publishing in open access shows which publications are available free of charge, therefore which scientific content was easier to access. This is particularly important because journalists who act as intermediaries between academia and people-not-involved-in-science do not subscribe to scientific databases and their access to specialist knowledge may depend on open access.

The analysis of methodological approaches reveals popular methodological choices, at the same time showing which approaches (theoretical, qualitative, quantitative or mixed) are rarely chosen. Comparison of methodological approaches with the accessibility variable (either open, free or restricted) shows what type of research is most accessible.

The third research issue is the distribution of institutions and countries in articles' affiliations, as well as the research cooperation at the institutional and international level. Focusing on this problem is essential because COVID-19 pandemic has been a worldwide phenomenon which, in a communicative context, may have had different effects in different cultures and societies. The analysis of cooperation networks shows whether contemporary communication

researchers are ready to exchange knowledge and jointly develop solutions. International cooperation could become a field for comparative studies, but on the other hand, due to pandemic restrictions, it was limited and mediated by the technology.

Fourth issue raised in the study is the summary of articles' main findings. Determining which research topics are the most popular allowed us to summarize the articles' main conclusions. Therefore, this article will allow future researchers to quickly review the findings of communication studies on the issue of COVID until 2022. Repeating reviewed research in post-pandemic conditions may provide interesting comparative conclusions in the future. Hence, this study shows not only who and how did the research, but also how they published it and what was discovered.

The research was guided by following research questions divided according to the scope.

A. Research questions pertaining to distribution and accessibility of COVID-related studies:

RQA1. How did the number of COVID-related articles change in particular years and which journals published the most articles on this topic?

RQA2. What is the distribution of articles published in open, free and restricted access?

In research question A1 we have focused on how the number of articles regarding COVID-19 in communication studies has changed in years 2020–2022 and which journals published most of them. As the accessibility of high quality research is one of most important issues in current academic discussion [14–16] the accessibility variable (either open, free or restricted) is taken into account in further analyses (research questions B1 and B2).

B. Research questions pertaining to methodology:

RQB1. Are there any observable trends in research approaches in studies regarding COVID-19?

RQB2. Are there any observable trends in research materials and participants selection?

C. Research questions pertaining to research affiliation and researchers' cooperation:

RQC1. What is the distribution of institutions and countries in articles' affiliations?

RQC2. What kinds of collaborations exist among institutions and countries?

D. Research question pertaining to main findings:

RQD1. What are the main findings regarding media and society?

2 Literature review

The pandemic's effects on various aspects of life generated significant academic interest and research have been carried out across a diverse range of disciplines. Several review articles concerning COVID-19 have been published in the field of communication and media studies, focusing on a variety of themes within the field. The review articles often discussed the characteristics, themes and outcomes of the studies.

Alharbi [17] conducted a meta-analysis on how covid was studied by communication and media scholars. Alharbi examined the methodological characteristics, theories, the geographical distribution and the publication avenues of the studies. His research concluded that especially mass communication aspects and social media were widely studied in the field of communication and media studies. His results also show that most studies used quantitative methods and were rarely theory-driven.

Ratcliff et al. [18] had similar findings as their review article found that studies conducted on public communication of uncertainty lacked theory-driven research and rarely used qualitative methods. While Lin and Nan [19] also found a need for more theory-based articles, the studies they examined in their review article had a more balanced use of both quantitative and qualitative methods.

Kurnaz [4] utilized bibliometric methods studying articles published in the field of communication studies during the first year of COVID-19 pandemic. She found that of over 1600 articles published this first year only 36 were related to COVID-19, often addressing social media, misinformation and contact tracing.

Similar to Alharbi's observations [17], several review articles focused on a widely studied topic of public communication during the pandemic. It was studied in the contexts of health communication, inequalities in said communication and communicating uncertainty in the time of covid [18, 19] Lin and Nan [19] further argued that studies in the context of health communication often focused on understanding how COVID-19 related information was communicated

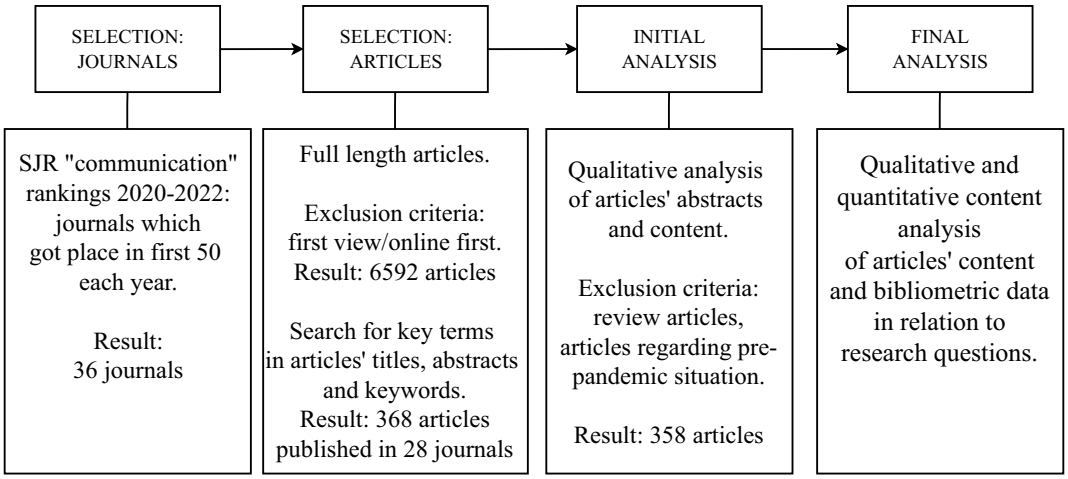


Fig. 1 Research process schema

through media. The studies in question also often had a goal of improving message effectiveness [19]. In contrast, Kuş and Öztürk [20] carried out a systematic review on studies addressing the infodemic and misinformation. Their focus was on mapping themes emerging from the studies on infodemic. They found that studies commonly had an emphasis on the propagation of misinformation, effects of misinformation and ways of combating misinformation.

It was found in the review articles that most COVID-19 related research in communication and media studies were conducted in Western Countries (especially US and UK) and China [4, 17, 18]

3 Materials and methods

3.1 Sampling of journals

In order to study how COVID-related topics are presented in top SJR journals within communication studies, we have adopted a predetermined procedure of research material selection, presented in Fig. 1. made with Drawio software. First, we have downloaded rankings for years 2020–2022 from Scimago Journal & Country Rank, according to "citable docs." criteria within the subject category "communication". Then, we have separated the first 50 journals of each year. The number 50 was established as it reflects the number of results SJR displays on one page. Our next step was to compile those 3 lists into one, including only those journals which appeared in the top 50 for all three years covered by our study (2020, 2021, 2022). Thus, our set of reviewed journals included 36 positions listed in Supplementary Material A.

3.2 Sampling of articles

To provide the best quality of our review, we specified our research material selection. We decided to narrow the study to original articles, research articles and review articles only, in order to provide as precise and comparable results as possible. Thus, our study excluded short essays, corrections, opinions, introductions, editorials, book reviews, comments, forums, reflections, demonstrations, discussions and corrigenda. The study was based on two-step review: the first step was the manual review of each published issue from 2020 to 2022. We have selected review- and research articles and then each of those articles was separately scanned for keywords. The search of articles was conducted manually, by going to each journal's website and searching for relevant papers. The searched keywords were: *covid, coronavirus, pandemic.* This set of search terms [21] as well as manual screening [22] has already been used in communication and media studies. Second step was an automated search for keywords in the Scopus database, to verify manual search.

In order to keep the study focused on articles dedicated to COVID, without those mentioning pandemic as an example for some other topics, we have searched for keywords in titles, abstracts and articles' keywords (where applicable). Articles addressing only pre-COVID situations were excluded.

Overall, initial review covered 36 journals, 150 volumes, 662 issues and 6592 articles, of which 368 (5,58%) mentioned *covid, coronavirus* or *pandemic* in their titles, abstracts and/or keywords. Those 368 articles were all written in English, some were also available in Spanish. In this set only 10 articles were review articles, of which 3 were focused directly on publications regarding COVID [18, 23, 24]. We decided that this is an insufficient number for comparative analysis and thus review articles were also excluded from the study. Overall, presented analysis includes 358 COVID-related research articles. Due to the extensive sample, a full list of reviewed articles is available in Supplementary Material B.

3.3 Coding and labeling

In our study, we used a mixed method approach, using both manual overview and automated software. We have read each article. Articles were labeled according to their access type (free, open or restricted) at the source (journal) website (RQA2). All databases were created in MS Excel, which was also used to create charts and tables in this article. We also created a database of studied articles' authors' affiliations,[1] in order to answer research questions pertaining to representation of institutions and countries (RQC1) and collaboration between them (RQC2). This step was necessary to normalize the notation of affiliations, as it differs between journals, e.g. Melbourne University/The University of Melbourne, UNSW/University of New South Wales, Rey Juan Carlos University/Universidad Rey Juan Carlos.

3.4 Quantitative analysis

We have conducted social network analysis (SNA) using Gephi v0.10.1 which was also used for network visualizations. Applied SNA does not consider the network's weight, as it is proven to be "inappropriate in situations where a smaller weight is preferred" [25]. For the institution-level analysis we used every highest-level unit provided in authors' affiliation. Thus, if the given author was affiliated to two different departments of the same university (or organization), the affiliation was normalized to the university (organization) and calculated as one node. Yet, if the author affiliated to $1+n$ universities (and/ or organizations), such affiliation was treated as $1+n$ nodes.

3.5 Qualitative analysis

The analysis of articles' materials and methods was conducted using bottom-up qualitative content analysis with in-vivo coding. Articles' (RQB1, RQB2) materials and methods were coded according to information provided in articles' methodological sections. We have developed following codebook for RQC1:

- Nonempirical – theoretical elaborations, without method section or clearly indicating that they are nonempirical in nature and the conclusions drawn therein are based on theoretical considerations and critical thought;
- Qualitative – authors declare to use qualitative methods or name their methods which have qualitative characteristics;
- Quantitative – authors declare to use quantitative methods or list the methods they used which are specifically quantitative;
- Mixed – authors declare to use mixed methods or list the methods they used, which are both qualitative and quantitative.

The codebook for RQC2 was as follows:

- Nonempirical – defined as above;
- Materials – all studies in the article were designed to analyze messages, images, texts, news, videos, network data flows, no human[2] participants were involved in the studies;

[1] Our network analysis of collaboration between institutions and countries was conducted with respect for the information provided by articles' authors. For example, Hong Kong Baptist University is assigned to both China and Hong Kong. In order to avoid inconsistencies, in case of duplicated names, we've added annotations structured according to the pattern: "(Country)", e.g. Hong Kong Baptist University (China) or Hong Kong Baptist University (Hong Kong).

[2] None of the reviewed studies included animal testing.

- Participants – all studies in the article were designed to study people's reactions, responses, discussions and its basic assumption was to invite human participants, no materials (defined as above) were studied in the article;
- Both – the article presented study/ies focused on materials and separate study/ies focused on participants (defined as above) or same study/ies conducted on both materials and participants.

For the qualitative summary of articles main findings we used thematization to identify popular themes in the articles. We conducted qualitative content analysis on the most occurring themes and they were reconstructed into selected topics presented in the article. All coding and analysis were conducted according to "The Coding Manual for Qualitative Researchers" [26] and "Qualitative data analysis: an expanded sourcebook" [27].

4 Results

4.1 A1. Distribution of articles

Among 36 journals we have reviewed for COVID-related articles, 28 included articles matching our criteria. The least number of articles published per journal in the years 2020–2022 was 1 (in "Journalism & Communication Monographs" and "Political Communication"), the highest was 41 (in "Social Media and Society") with median = 8,5 and mean = 12,79. Although the number of publications may be a valuable indicator of interest in a given topic, it is worth noting that journals differ in the number of published texts. Hence, another important piece of information is the percentage of COVID-related research articles in relation to the total number of original articles published by a given journal. Thus, although "Social Media and Society" published most research articles about COVID, these articles covered 9, 88% of all full length articles in this journal. The highest interest was in "Comunicar" (12, 50%) and the lowest in "Political Communication" (0,91%) with median = 5,80% and mean = 6,36%.

The number of COVID-related research articles increased over time: 14 in 2020, 148 in 2021, and 196 in 2022. Such an increase could be caused by at least two reasons. Firstly, the growing impact of COVID-19 pandemic over time, as at the beginning of 2020 it was impossible to predict the course of the global situation. Secondly, the publishing process is time-consuming, especially in terms of best ranked journals which apply high standards. As the study did not include first view/online first articles, some of articles were excluded because they were still undergoing the publishing process. Full distribution of articles according to journals, time and accessibility is presented in Supplementary Material C.

4.2 A2. Accessibility (open, free or restricted) of articles regarding COVID-19

The analysis of articles' accessibility was conducted according to journals' labeling of those articles. For journals published by Elsevier, we have applied an accessibility assessment framework provided by Owens and Thaw [28].

Of the 358 articles we studied, a total of 140 articles had restricted access, 86 articles had free access, and 132 were available in open access. It is worth noting that among 132 open access articles, 78 (59,09%) were published in open access journals ("Big Data & Society, "Comunicar" and "Social Media & Society"). This is an example of how open access policy of journals contributes to the global accessibility of high quality research.

4.3 B1. Studied articles' methods

We examined research approaches used in reviewed articles. As each article was read, it was labeled as nonempirical, qualitative, quantitative or mixed. Overall, out of 358 articles, 33 (9,21%) were nonempirical, 181 (50,56%) used quantitative methods, 109 (30,45%) used qualitative methods and 35 (9,78%) represented mixed methods approach.

Figures 2. and 3. present the distribution of articles using given methods according to time and accessibility respectively.

As Fig. 2. depicts, COVID-related articles were published more frequently in time. This is understandable due to the time covered by the study – it was a time of global pandemic with an active threat and restrictions. Research and publishing processes also take time. The use of methods increased annually, with the exception of empirical methods, which peaked in 2021. This may be due to the gradual relaxation of restrictions, which allowed field research to be conducted, which in turn resulted in a smaller number of theoretical studies. Another possible explanation is that knowledge about COVID has become more widespread over time, which has allowed research to be planned and established in the literature. Also,

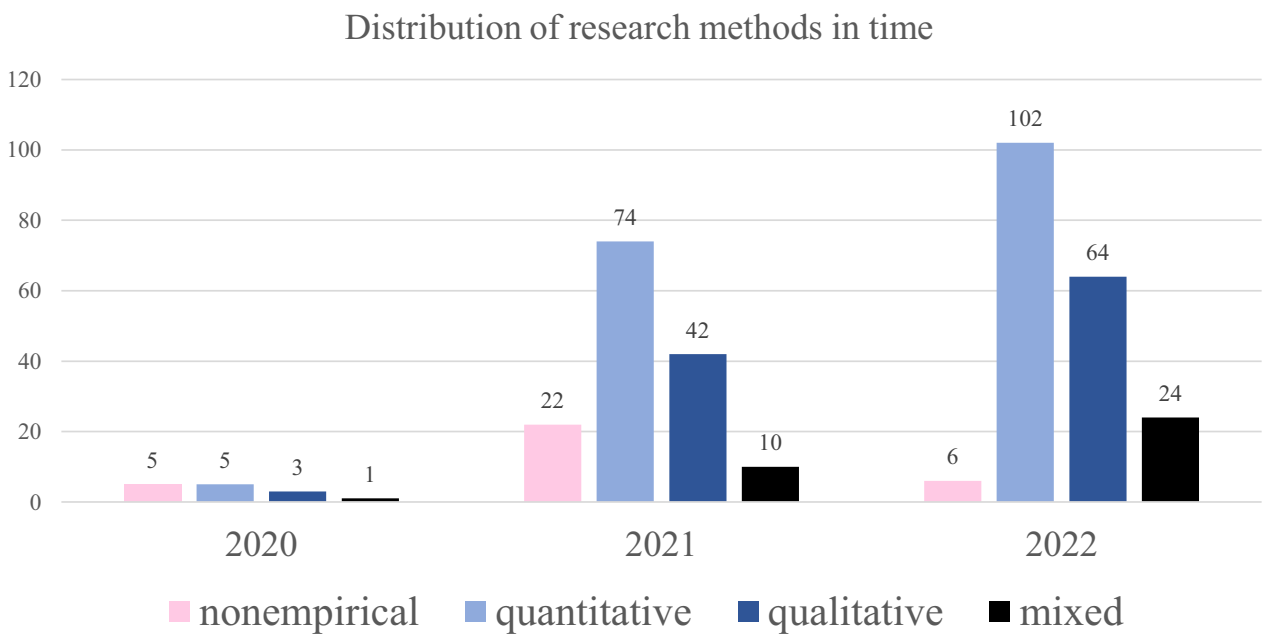
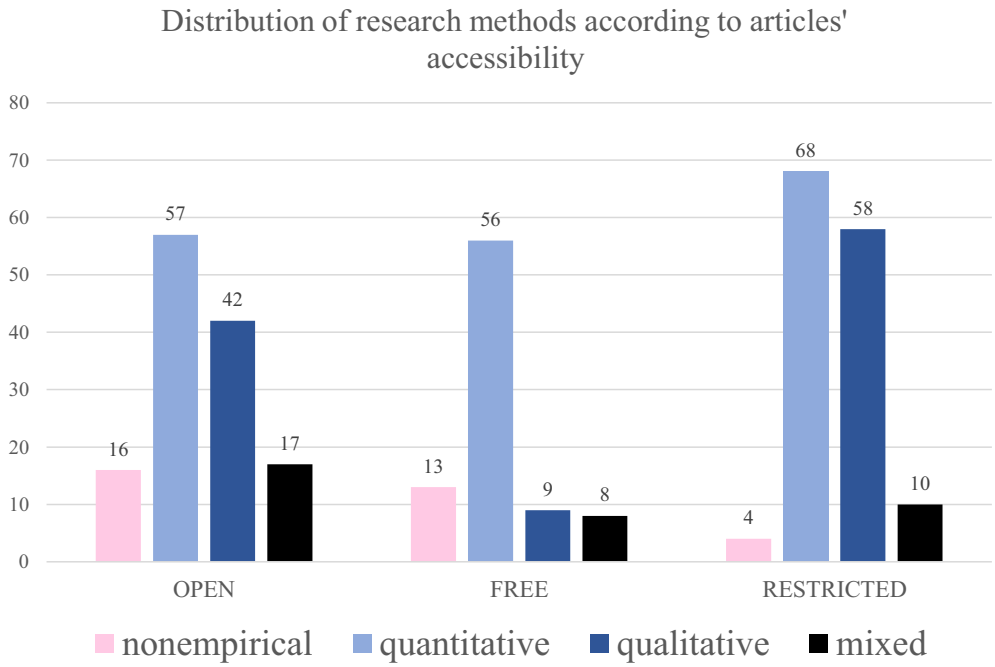


Fig. 2 Distribution of research methods in time

Fig. 3 Distribution of research methods according to articles' accessibility



nonempirical articles have best open/free-restricted access ratio: only 4 out of 33 were published in restricted access. A possible reason is the issue of the costs of the research process – reducing expenses for field research may allow covering the costs of open access.

Among empirical studies, mixed methods approaches were least popular. This could be caused by the time-consuming character of such studies, as well as familiarity with both qualitative and quantitative code of conduct. Also, as these articles were published in high-level journals, they often result from international cooperation. Perhaps quantitative approaches are easier to plan, manage and summarize on the international level, as math is a universal language with no cultural differences. However, as Fig. 2 shows, despite the overall low popularity, an increasing number of publications using mixed methods can be observed over time. Articles using mixed methods had the largest annual growth.

Table 1 Distribution of materials and participants selection according to articles' accessibility, regarding methodological approaches

	Open access	Free access	Restricted access
Nonempirical	**16**	**13**	**4**
Mixed	**17**	**8**	**10**
Materials	13	4	3
Participants	2	2	6
Both	2	2	1
Qualitative	**42**	**9**	**58**
Materials	22	6	24
Participants	19	3	32
Both	1	0	2
Quantitative	**57**	**56**	**68**
Materials	26	20	14
Participants	30	36	50
Both	1	0	4

Each bold row for empirical articles (mixed, qualitative or quantitative) contains the sum of the non-bold rows listed below it (materials, participants or both)

Figure 3. depicts the distribution of research methods according to articles' accessibility: either open, free or restricted. Most of the nonempirical and mixed-methods studies were published in open access, and most of articles using either qualitative or quantitative methods were published in restricted access.

Qualitative studies distinct from others on the accessibility level. More than half of those articles (58 out of 109) were published in restricted access. This is an alerting result, as qualitative studies are usually more time consuming. Publishing in open access increases given article's impact [29, 30], although it should be noted that there is some variability on the impact depending on the field [31, 32] and the impact within communication and media studies requires further investigation. Low accessibility of qualitative research may lower their impact, and in consequence time-consuming in-field-engaged studies could have less impact on global research and community.

4.4 B2. Studied articles' materials and research participants

Apart from overall methodological approaches, we have also searched for trends in studied articles' materials and participants selection. This division was based on articles' methodological sections. We used four codes: "nonempirical", "materials", "participants" and "both", the last one for studies including both materials and human participants.

Table 1. shows the distribution of materials and participants selection according to articles' accessibility, regarding methodological approaches in each case.

Taking into account the accessibility variable, we may observe an interesting phenomenon within articles applying qualitative approaches. While over a half of qualitative articles based on materials research was published in open or free access, the accessibility of studies involving human participants is below 50%. It is easier publish a high-ranking qualitative article on COVID-19 based on materials analysis than to publish the same type of article based on studies involving human subjects. In conclusion, qualitative research is most often published in restricted access, and if it is available free of charge – it is usually research on materials (video, text, image, subscription network) rather than research involving human participants (e.g. interviews, panels, ethnographic observation). Possible reason could be in research funding: research involving human participants could be so expensive that there would be not enough budgets for open access publishing. Another possible option is the relatively poor repeatability of qualitative research due to the human and cultural factor in the assessment of the phenomenon under study. This might be why there is no investment in the availability of qualitative research. This problem definitely requires further investigation.

4.5 C1. Distribution of institutions and countries

We have analyzed articles' affiliations in terms of institutions, countries and collaborations between them. Overall, analyzed articles were affiliated by 490 institutions from 68 countries. We have focused on the overall number of how many

Fig. 4 Total number of affiliations (for countries with ≥ 10)

times a given institution or country was affiliated, as well as the number of articles affiliated to a given institution or country. Figure 4. presents distribution of affiliations to given countries for those which were affiliated at least 10 times.

The most represented institutions were University of Texas (USA), affiliated 19 times in 10 articles and University of Wisconsin (USA) with 19 affiliations in 7 articles. They were followed by University of Amsterdam (Netherlands): 16 affiliations in 8 articles. The popularity of these US universities in our results may be due to the labeling of the highest-level unit provided in authors' affiliation: University of Texas and University of Wisconsin are state university systems.

As shown in Fig. 4., the dominance of Europe is granted by southwestern countries. This could be explained by the early pandemic's impact on Southwestern European countries such as Spain and Italy [33, 34]. Another possible reason could be participation in the European Union, which funded research on COVID [35]. In Fig. 4. 8 out of 11 countries are EU members. Also, studied journals published articles only in English and Spanish, which advances the accessibility and dissemination of the research conducted in countries where English and Spanish are official languages.

American and European universities are leading in publications in the field of COVID in general. The possible reason for that is that they have launched fast-track research funding programs targeted at pandemic [35]. In general, the top funders of COVID-19 publications were U.S. Department of Health and Human Services, National Natural Science Foundation of China and European Commission [35].

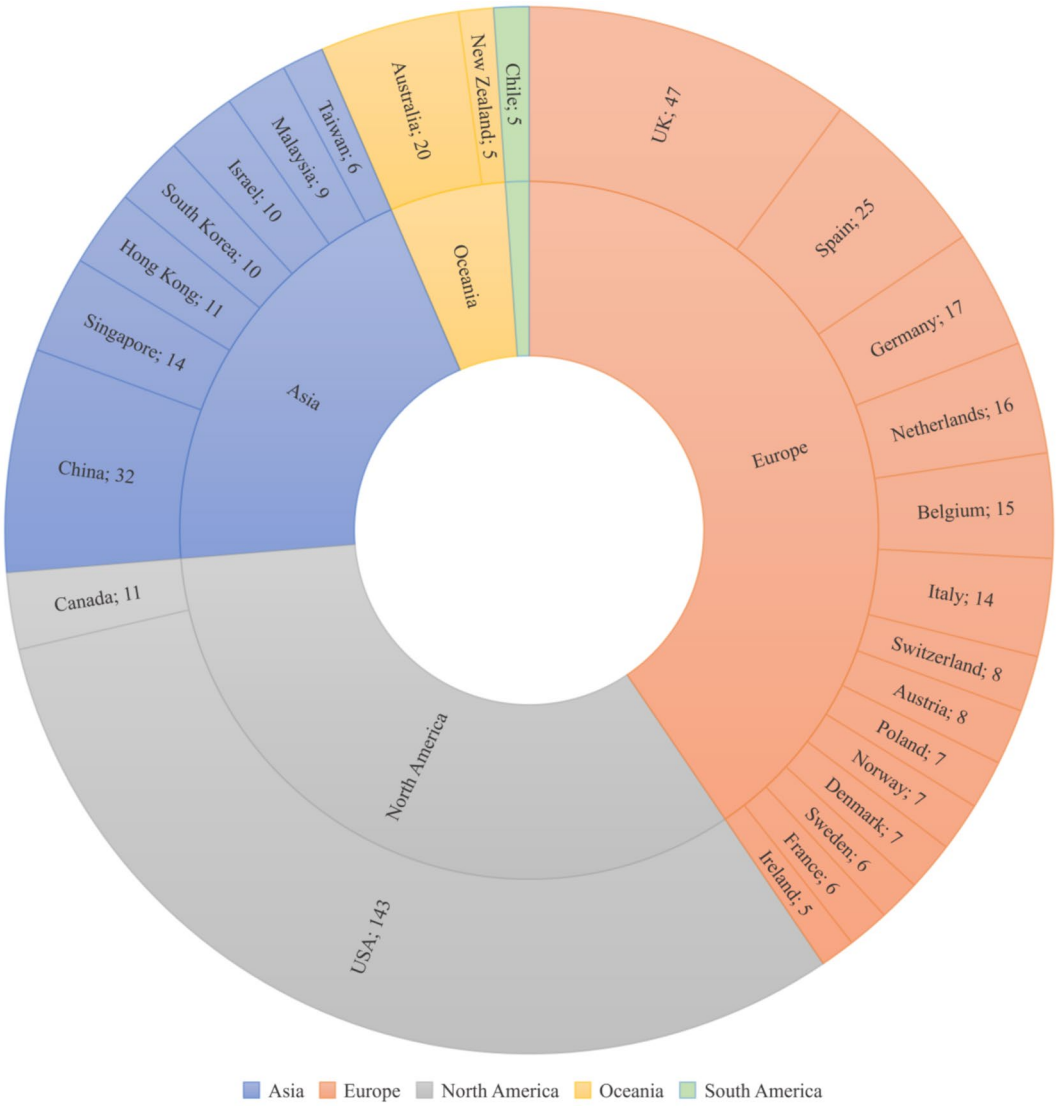


Fig. 5 Number of articles affiliated by given country (for countries affiliated in ≥ 5 articles)

High position of American universities reflects the overall statistics for countries. USA was the most often affiliated country: 369 times in 143 articles, followed by the UK: 132 affiliations in 47 articles, and Spain: 64 affiliations in 25 articles. Representation of countries per article is presented on Fig. 5.

The dominance of the USA and UK may be partly explained by the fact that all analyzed journals are publishing in English, which makes it more accessible for researchers that speak English as their first language to produce texts with good linguistic quality. Overall statistics reflect the global dominance of North America and Europe in article's publishing in social sciences [36].

Overall, there is observable underrepresentation of African and South American countries, which reflects the concerns already resounding in communication studies [37, 38]. Our study is yet another proof of what Cheruiyot and Ferrer-Conill [39] name the "core-periphery challenge in knowledge production".

4.6 C2. Collaboration between institutions and countries

Qualitative studies on authors' collaboration have shown that it results in broadened knowledge and higher scientific quality [40, 41]. Thus, its natural consequence is increased chance for publication in high impact journals and receiving

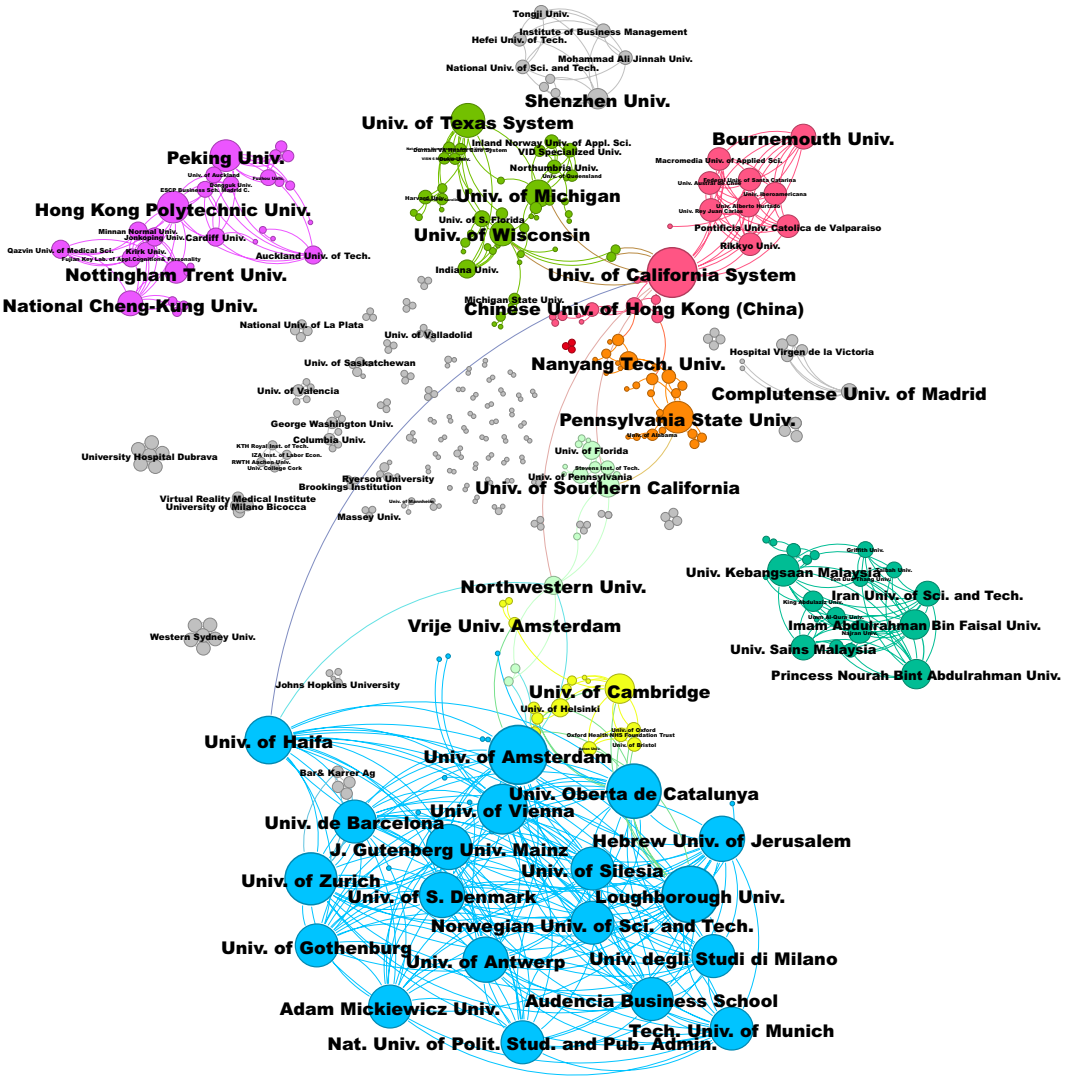


Fig. 6 Visualization of between-institutions collaboration, including 424 collaborating organizations

more citations [42]. Thanks to global ICT solutions geographical diversity of collaboration is possible [43], which has been a particularly important factor during pandemic restrictions.

In our study we have used network size, average degree, density, average path length and diameter as parameters of collaboration analysis, on both institutional and country level.

Overall, reviewed 358 articles were affiliated by 490 institutions. Cutting off institutions which haven't been collaborating with any other, the collaboration network of institutions consisted of 424 nodes and 815 edges, presented on Fig. 6.

The institutional network had a diameter 11, density 0,009, average path length 4,49 and average degree 3,844. The distribution of collaboration in time is as follows—2020: 6,5%, 2021: 38,9%, 2022: 54,6%, which reflects the overall increase of COVID-related articles.

Density measures internal strength of the network [44], as it is the number of existing relations divided by the maximum number of possible relations [45]. The network analysis revealed that very few of possible connections (0,9%) were actually achieved. Low network density indicates that most of the research outputs were produced independently, without long-term, high-intensity collaborations [46]. There are several possible explanations for such low density:

- Varying research methodologies – results discussed previously in this article show the variety of methodological approaches with the dominance of quantitative studies. Some methods create challenges in finding common ground for collaboration. This is particularly distinctive for qualitative studies, which are culturally sensitive.

- Access to a wide range of research tools, including software and laboratories – not all countries place similar emphasis on financing science, and differences in the availability of research tools may also occur within a given country (e.g. public/private university). Therefore, even despite the popularity of quantitative approaches, cooperation between institutions can pose challenges.
- Geographical and institutional barriers – travel restrictions introduced during the pandemic have negatively affected international cooperation. Since the network includes institutions from six continents, administrative barriers (such as permits, document templates, other policies regarding research ethics or privacy concerns) may have been important.
- Time pressure – the pandemic as a global crisis created an urgent need for timely research results and international cooperation is time-consuming due to the barriers described above.
- Competition – individual institutions and countries often compete for research funds (e.g. grants) or places in rankings, which may constitute a significant obstacle to cooperation between them.
- Diversity of journals included in the analysis – last but not least, the diversity of journals could have influenced the result of the analysis. "Communication" is an extremely broad term that combines various specialties. The set of analyzed journals included those devoted to issues such as advertising, journalism, politics or big data. These journals, although representing communication studies, have their own specificity. The diversity of these journals' profiles may have resulted in a low network density.

Network visualized in Fig. 6. depicts that authors researching COVID-19 within communication studies are grouped into smaller communities. Five large clusters of cooperation and three smaller ones are observable. The blue cluster depicts a subnetwork of collaboration between 2 Israeli universities: Hebrew University of Jerusalem and University of Haifa, and 17 European institutions. Within those institutions there are four universities with highest degree in the network: University of Amsterdam, which cooperates with 25 other institutions, Loughborough University (24), Universitat Oberta de Catalunya (23) and University of Zurich (22). The forming of this cluster was facilitated by the two articles, each authored by 19 researchers, of which 17 were the same authors [47, 48]. Also, the highest degree of the University of Amsterdam may result from its general high representation: 16 affiliations in 8 articles. Most of the institutions in this cluster represent European Union member countries, so EU funding could be a possible explanation for the forming of this cluster.

The center of the pink cluster is constituted by the University of California, which is the institution with highest betweenness centrality (the influence parameter) in the network BC = 8606.03. This cluster shows an intercontinental collaboration: University of California collaborates with institutions from Asia (China, Japan), Europe (Germany, Spain, UK) and South America (Brazil, Chile, Mexico). This cluster is elongated by Chinese University of Hong Kong and its cooperation with University of Kent.

The light green cluster includes two most represented institutions: University of Texas (USA), affiliated 19 times and University of Wisconsin (USA) with 19. The University of Wisconsin has also the second best betweenness centrality in the network: BC = 4559.17. This cluster reflects the cooperation of institutions from English-speaking countries. 62% of all nodes in this cluster are American institutions, 12% are Australian, 4% are from the UK and 2% from Canada.

The network also has two large detached clusters. The violet one represents the collaboration of Asian institutions, which constitute 66% of all nodes in the cluster. Krirk University from Thailand, which was affiliated in only 1 article, also belongs to this cluster. There are two New Zealand universities in this cluster (University of Auckland and Auckland University of Technology). The dark green cluster shows a subnetwork of collaboration dominated by Asian countries (85%), especially from Saudi Arabia (35%) and Malaysia (20%). This cluster also includes institutions from underrepresented countries, such as Oman or Vietnam. As some underrepresented countries tend to collaborate within detached clusters, this raises a question about how the choice of collaboration partners may affect the future collaboration and whether it affects publishing success rate.

There are also 3 smaller clusters observable in the network. Yellow one is dominated by European institutions (62,5%) of which 70% are from the UK. The center of this cluster is the University of Cambridge with degree range 12. This smaller cluster shows the internal UK collaboration, but also relatively strong in-subnetwork position of the University of Helsinki. Another smaller cluster, visualized with mint color, reflects strong cooperation of North American countries, which constitute 60% of this cluster. Among institutions in this cluster, University of Southern California has the highest degree (9). Last smaller cluster, colored in orange, is geographically diverse (including institutions from Asia, North America, Europe and Oceania). In this cluster the institution with highest betweenness centrality (BC = 2311.88) and degree (13) was Pennsylvania State University.

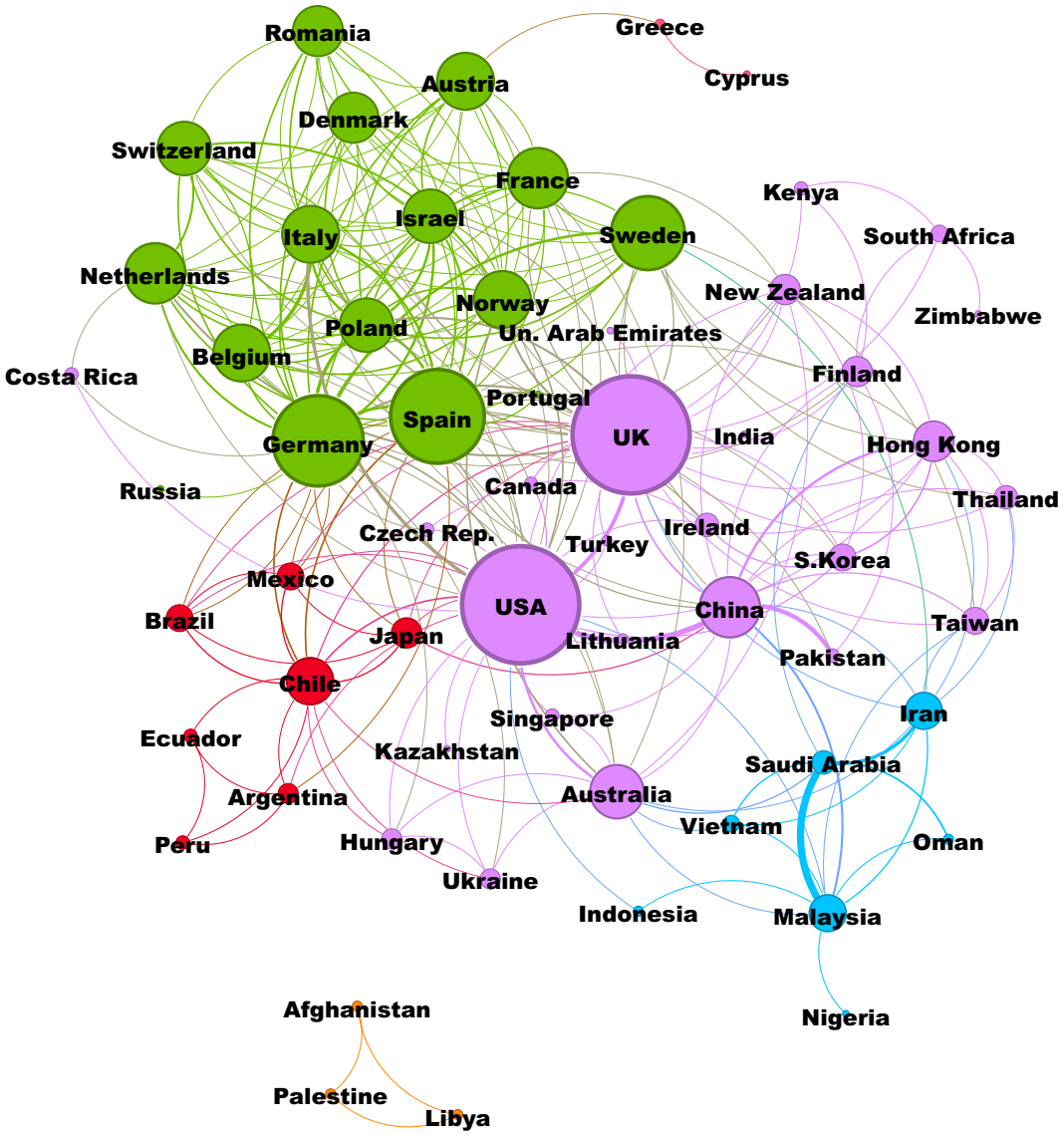


Fig. 7 Network visualization for collaboration on a country level

There are observable cooperation clusters geographically determined by North America, Europe, Asia or the Greater Middle East, but there are none dominated by African, Oceanian or Southern African countries. These results reflect our previous findings regarding the number of affiliations: there aren't many authors from those regions, so they cannot dominate the network. They also don't create smaller clusters. The influence of cooperation with dominant institutions on scientific production in underrepresented countries requires further investigation.

Analyzed articles were affiliated by authors representing 68 countries. Cutting off countries which haven't collaborated with any other, we have created a network consisting of 61 nodes and 265 edges, presented in Fig. 7.

The countries network had an average degree 8,69, density 0,145, diameter 5, and average path length 2,19. The United Kingdom and USA had the highest degree level (34), and the USA has slightly higher betweenness centrality (413,08) than UK (405,90). Therefore the UK and the USA are the most influential countries in terms of collaboration within communication studies regarding COVID-19 in SJR best ranked journals. Yet, the USA does not collaborate with any African country.

The visualization of collaboration on country level, presented in Fig. 7., reveals the presence of 6 clusters: 2 large, 2 medium and 2 very small. The green cluster is dominated by European countries. It results from the close institutional cooperation of 2 Israeli universities with 17 European ones, which was marked as a red cluster in Fig. 6. Russia

collaborates only within Europe, with Germany, yet, since 2022 cutting off any collaboration with Russia may be caused by Russian invasion on Ukraine.

The violet cluster is the biggest one, and the country with highest betweenness centrality within it is the United States with BC = 413,08. Both the USA and the UK have the highest degree (34), which is twice as high second in the cluster China (17). Zimbabwe only collaborated with South Africa.

The medium blue cluster depicts the cooperation between Greater Middle East countries. In this small sub-network Malaysia was the most influential country (BC = 117.47) and had the highest degree (10) together with Iran (10). The collaboration of Oman didn't reach past the continental border.

Second medium cluster, colored in red, shows the cooperation between South American countries. Peru and Ecuador collaborate only with South American countries, not crossing the continental border. Within the red cluster, Chile was the most influential country with degree 13 and BC = 100.76. The betweenness centrality of Argentina, Ecuador, Peru and Mexico was 0.0.

Co-working Cyprus and Greece, marked in pink, are both connected to the network only due to Greece's collaboration with Austria. There is also a detached orange sub-network of collaboration between Libya, Palestine and Afghanistan.

4.7 D1. Main findings

4.7.1 Media consumption

Studied articles strongly argue that news consumption and social media usage increased in the beginning of the pandemic [49–57]. People gravitated toward news sites and followed press conferences and social media in urgent need of information in the uncertain and rapidly developing situation. It was indicated that the increase in media usage concentrated especially in fast and immediate coverage offering media, such as online news media, social media and television [49, 56]. The articles also suggested that anxiety and concern about the pandemic were indicators for a rise in news usage and information seeking [49, 54, 58].

As the crisis prolonged a decrease in news consumption was largely reported and it was linked to corona news fatigue due to news overload in a long enduring crisis [50, 53, 59–61]. News overload, negativity of news content and feeling emotionally drained also related to news avoidance as people were unable or unwilling to keep engaging with news [59–63]. Partial news avoidance and finding a balance between consuming news (to be well-informed) while avoiding news overload was encouraged, and it was reported to have positive effects on participants' well-being [60, 63]. Problem-focused news practices were found to be troubling, as negative news were a source of distress for the audience. Solutions journalism and constructive journalism showed promise in providing information in a way that was less stress-inducing during a crisis. The use of constructive headlines was found to reduce the feelings of anxiety and anger [64–66]. Research was conducted on the influence that news framing could have on the support concerning precautionary safety measures. While information that highlighted negative effects via loss framing caused negative emotions, such as frustration and powerlessness, positive gain framing of information was effective in encouraging support for precautionary measures against the pandemic [67]. Children were especially negatively emotionally affected by the COVID-19 related news and greater news exposure at home was associated with higher levels of fear [68].

Several studies also reported that active and especially problematic social media use was heavily linked to depression and anxiety [69–72]. Active use of social media was related to loneliness and both loneliness and social anxiety intervened with social media usage and depression [72, 73]. Anxiousness was also related to consumption and active sharing of COVID-19 related content. Information overload was found to be a possible trigger for social media fatigue [54, 70, 74]. Lee, Yamamoto and Tandoc [75] found that seeking information from social media had a negative impact on gaining factual knowledge and it predicted subjective knowledge and knowledge miscalibration, leading people to think they knew more about the virus than they actually did.

However, social media was also considered as a source of social support and stress-releasing. Studies indicated that online social connection can compensate for reduced offline support, and that it can help coping with anxiety during isolation [51, 70, 76]. Getting social support from social media was argued as a way to help to maintain and extend empathy towards others, despite the elevated levels of anxiety [77]. Using social media to cope with the pandemic relieved feelings of distress and anxiety and increased the feelings of happiness. Loneliness predicted using social media to keep in touch with family and friends [51].

COVID-19 affected the communication on dating apps. Noland [78] found that people communicated more with each other about health, sexual health and infection transmission and were more aware about health risks.

4.7.2 Preventive behaviors

The articles also argue that digital media can encourage people to practice COVID-19 preventive behaviors directly or indirectly. The information on the virus can directly increase preventive behavior, or its impact can be indirect – the information may cause intense worry and this may increase preventive behaviors. Similarly a study that was researching the impact of FoMo (fear of missing out) on peoples' behavior found out that while use of social media increased the fear of missing out, this was not related to users personal intentions to follow public health recommendations – the fear of the virus was the biggest indicator of behavior [79–81]. Communication messages in public service announcements can alter the perceived level of threat from COVID-19. While heightened levels of threat may increase peoples' willingness to engage in preventive behaviors, the levels need to be monitored since they may also lead to irrational behavior, such as stockpiling [82]. Even though pro-governmental media interactions related negatively to violations against COVID-19 preventive measures, exposure and engaging with anti-governmental messages related positively to violations through positive attitudes towards violations [83].

4.7.3 Journalism and media elites

Several studies also investigated the coverage, representation and framing of COVID-19 in different countries and media outlets. COVID-19 reports were also compared to Spanish Flu and SARS coverage [84, 85]. It was investigated how journalism employed data visualizations and coronavirus-related numbers and how the public interpreted the information [86–89].

The role of experts in media was investigated in relation to COVID-19. While the audiences preferred to have health expert views on television, experts got very limited coverage [90]. Also "social media COVID-19 elites" were explored and it was found that journalists, media organizations and political accounts are most often crowdsourced as sources of information related to the pandemic. Healthcare professionals were just a small part of the elites [91].

An article by Masullo, Jennings and Stroud [92] investigated the crisis coverage gap at three points during the pandemic. It demonstrated a significant divide between the news that were delivered and the news that the public sought about COVID-19.

Studies also addressed the changes that pandemic brought to journalistic work. They commonly focused on changes in practices, journalists' experiences and emotional labor. Professional isolation and the lack of support were named as prominent difficulties that journalists faced during the pandemic. Stress, anxiety and frustration were commonly experienced and organizational support was found to be important for coping and relieving stress [93–96]. The pandemic was found to increase journalists' economic, bodily and political precarity [97]. COVID-19 also highlighted pre-existing inequalities among journalists. Uncertainty, fear of unemployment and the lack of support were particularly relevant to freelance journalists [94, 95]. Journalists increasingly relied on interactive digital tools for stories, meetings and virtual sourcing [98].

Studies also investigated press freedom in the time of a crisis. Pandemic was found to worsen the challenges to press freedom. A study by Palmer (2022) addressed that press freedom watchdogs named government authorities as the biggest threat to press freedom during the pandemic. Other studies also addressed this issue and it was discussed how government restrictions hindered critical journalism and how especially in countries with poor press freedom journalists faced several obstacles such as internet shutdowns, disinformation and controlling the press [99, 100].

4.7.4 Infodemic

Crises increase the need for information and explanations. Uncertainty and the desperate need for answers provide a space for disinformation and conspiracy narratives.

Disseminating fake news and misinformation through digital platforms were studied. News sites with low fact-checking scores were found to spread misinformation and news organizations sometimes kept using information and sources that were known to be misinformed [101, 102]. It was concluded that people who frequently use tabloid or alternative media are more likely to agree with disinformation and to be skeptical of official information [103, 104]. Uncertainty, anxiety and confusion about the truthfulness of information were also linked to agreeing with misinformation and fake news [105–107].

The studies conclude that in social media the main sources of misinformation are usually high-profile, official and verified accounts. Misinformation was amplified by partisan media sources and political figures [101, 108–110]. Twitter's most influential actors in disseminating COVID-19 related information after the outbreak were Donald Trump, QAnon and political right pundits [110]. It was also noted that in Reddit misinformation was spread especially in conservative subreddits [111]. The United States was found to originate and spread a disproportionate amount of COVID-19 related misinformation [102]. Low-credibility content often had a higher prevalence on social media than content from high-credibility sources [108, 109].

While exposure to misinformation shared by influencers did not itself significantly increase misbeliefs or mistrust in official information, sharing influencers attitudes and finding the influencer credible predicted a rise in mistrust [104].

4.7.5 Science skepticism

COVID-19 skepticism was found to have similarities with other forms of science denial, such as climate change skepticism and vaccine skepticism [112]. Ideology was also found to be a predictor of trust in science. Science skepticism was greater among the political right that wanted to maintain the status quo without government interference or restrictions to personal freedoms. Compared to left wing individuals conservatives had a lower trust in scientists and vaccine policies and they also were more likely to spread COVID-19 related misinformation and conspiracy narratives on social media [110, 112–115]. Trust in science, as well as in government and citizens, was an important indicator of following COVID-19 preventive measures [115, 116]. Conservatives' trust and willingness to engage in preventive measures increased, when the instructions came from a Republican instead of an unidentified government official [115]. Although a study by Shin et al. [117] has shown that both Donald Trump and republican political elites were significantly less likely to promote preventive measures than their democratic counterparts.

4.7.6 Fact-checking

During the early stages of the pandemic social media platforms tried to counter the spread of misinformation primarily by reducing the visibility of misinformation. Platforms used human and algorithmic actors in fact-checking and labeled misinformation with false tags and demoted or removed inaccurate content [118, 119]. Just labeling the false content was not found to be very effective, but the addition of a journalistic factcheck, that offered explanatory context for why it was false and provided accurate information, was effective in countering misinformation. Correcting misinformation reduced misperceptions and the sharing of misinformation on social media [119–122]. While individual evaluation of the veracity of information reduced the probability of sharing fake news, individuals also tended to overestimate their knowledge, and their own evaluation often led to falsely assessing the veracity [122–125]. Promoting critical media and information literacy skills were deemed important in countering infodemic, but the results also showed some inconclusiveness on the effectiveness of this approach [104, 121, 123, 124, 126].

4.7.7 Conspiracy narratives

It was examined how conspiracy narratives morph and merge into different socio-political contexts [127]. Conspiracy narratives both stemmed from existing tensions between different groups and they also exacerbated these tensions [128]. While conspiracy narratives were distributed on various social media platforms, they were more prevalent on dark platforms that are less regulated and moderated, e.g. 8kun and Gab [114]. Although conspiracy theorists shared some common characteristics, they were not a unanimous group. Different narratives also contradicted each other (e.g. denying COVID-19 and 5G theories) and conspiracy theorists participated in debunking contradicting narratives [114]. Believing in conspiracy narratives predicted risky behaviors and refusal to participate in COVID-19 preventive measures [129]. Conspiracy channels on social media also advocated hate speech and the targets varied on different stages of the pandemic, from Chinese people to journalists and healthcare workers [130]. In turn, heterogeneous discussion networks with diverse views were negatively associated with misinformation due to the high possibility of corrective information [131].

4.7.8 Discrimination, violence and inequalities

The articles examined a wide range of discrimination based on race, gender and age. Racist discourse and hate speech on social media were studied. Many articles focused on racism against Asians, often addressing the racist discourse of

Asians as disease carriers during the pandemic [132–136]. It was found that racism against Asians peaked in the USA when mortality rates were at their highest, and people who lived in cities with high levels of hate crimes were more likely to post offensive, racist tweets [134]. Asian American journalists reported experiences of indirect harm due to the racist discourse during the pandemic. They discussed external harms, such as racial microaggressions, and internalized harms as they reported anxiety and fear [135]. It was found that media framing affects public's attitudes and using stigmatizing terms such as "Chinese Virus" could trigger negative thoughts and increase blame and prejudice against Asians [133]. It was also examined how past intergroup contact could predict supporting discriminatory Chinese restrictions in the UK. Positive contact was associated with lower support for discriminatory restrictions and negative contact predicted increased support. Fear of the outgroup caused people to support discriminatory restrictions [136]. The pandemic also increased racism on dating apps and even though Chinese women had encountered prejudice frequently even before the pandemic, it became more direct and aggressive after the outbreak [137]. Both Black and Asian participants of a study were experiencing mask-related, race-based social identity threat from both the public and police. Mask wearing risked them being racially profiled [138].

It was investigated how collective narcissism could explain people's attitudes toward other groups, particularly in threat situations. Even though collective narcissism constituted negative attitudes against outgroups, it could also encourage intergroup pro-socialness [139].

Domestic violence and cyberbullying were also studied [140–142]. Bas, Ogan and Varol [143] studied how legacy and social media were used in Turkey to bring awareness to femicide. Violence against women increased during the pandemic and the coverage brought awareness and emotional engagement, but it was also noted that legacy media still often failed to report essential facts.

The pandemic also exacerbated gender inequalities in several aspects of life, including, for example, gendered divisions of labor and economic stability [144]. The importance of digital technology became evident during the pandemic. Studies looked into the consequences of digital divide. It was concluded that digital technology did both support and further marginalize already marginalized people [145–147]. COVID-19 discourse aggravated ageism: socially stigmatized older age, it strengthened the perception of older adults as vulnerable, which aggravated hostile and benevolent expressions of ageism [148].

4.7.9 Activism

Online and offline activism during the pandemic were also investigated. It was argued that the contagious spread of negative emotions, powered by the virus and isolation, created a tight atmosphere. Such an atmosphere contributed to increasing anger when facing systemic injustices which motivated participation in protests despite the health risks [149]. Lee, Tao and Li [150] focused on the motivations of Asian Americans in engaging in activism. They concluded that identity increased perceived injustice, efficacy and motivation to fight racism. This translated into online activism, which in turn supported engaging with offline activism.

5 Discussion

In this review of Scimago Journal Rank best ranked journals in years 2020–2022, we have identified 6592 full-length articles, of which 368 (5,58%) published in 28 journals, mentioned *covid, coronavirus* or *pandemic* in their titles, abstracts and/or key words. This result shows the gap between high-impact communication journals and high-impact medical and infectious disease journals, for which the result was 16,2% even despite the shorter time span [5]. After excluding articles mentioning only pre-pandemic situations, our study included 358 articles.

Our analysis revealed an in-time increase of COVID-related articles within SJR best ranked journals. While in 2020 only 14 articles on the subject were published, in 2021 the number increased to 148 articles and in 2022 to 196 articles. The average percentage of research articles addressing COVID was 6,36 in relation to the total number of original articles published by a given journal. Highest relative interest was in "Comunicar" – in this journal, of all full-length articles, those regarding COVID constituted 12.5%.

Overall, 60,89% of all COVID-related articles were available without charge. Compared to global open access statistics [151], according to which in years 2000–2020 the highest percentage of articles having some form of open access was 56,86%, this is a very promising result. A probable explanation for this result is the general popularity of the topic of the COVID pandemic, not only in academia, which resulted in an overall greater interest in scientific publications. Thus,

publishing articles in open access has become an opportunity to increase citations for both journals and authors. Most of the open access articles were published in open access journals, which reflects how open access policy of journals contributes to the global accessibility of high quality research. While some research has previously addressed the publication avenues, accessibility has not been often addressed on the field.

There is an observable trend of using quantitative methods, whereas mixed methods approach is less popular. Over 50% of articles studied used solely quantitative methods, while 30% used solely qualitative methods. The under-representation of qualitative methods has been recognized in other covid-related communication studies as well [17, 18]. More than a half of qualitative studies have restricted access, while nonempirical articles have the best open/free-restricted access ratio.

Articles were affiliated by 490 institutions from 68 countries, with USA having the greatest representation (University of Texas being especially represented) and underrepresentation of African and South American countries, which reflects the core-periphery challenge in knowledge production. Most research was conducted in western countries (especially USA and UK) and China. These findings are consistent with other studies from the field [4, 17, 18].

The network analysis revealed that very few of possible connections were actually achieved. University of California was recognized as a highly influential institution within the collaboration network, and there was dense collaboration between Hebrew University of Jerusalem and 17 European institutions. Although countries from Europe, Asia, North America and Greater Middle East create geographically determined clusters, there are none such local clusters created by researchers from Africa or Oceania. Referring to previously mentioned core-periphery challenge in knowledge production, these results show that the core will be fine without the periphery, but periphery needs core to stay visible. Similar studies on COVID-19 suggest that the pandemic should be used as an opportunity to reassess global collaboration in research and education, emphasizing the need for inclusive funding mechanisms and incentivization [17, 152, 153].

Media consumption during the pandemic was a widely researched topic. Studies investigated media usage and the effects of COVID-19 related media content. Another popular issue within this theme was the impact that media had on people's behavior, their views and their willingness to engage in virus preventive behaviors. News fatigue and news avoidance were also well represented. Many studies also investigated problematic social media use and its relation to mental health, more specifically to depression and anxiety. Several articles also noted the positive influence that media, specifically social media, could have on people through social support and stress-releasing. Studies also addressed the impact that COVID-19 had on journalistic work. Research was conducted to study changes in journalistic practices, challenges related to uncertainty and the lack of support and journalist's experiences with new working environments.

Infodemic and the spreading of misinformation also obtained research interest. It was studied how well people recognized misinformation and fake news, how they reacted to them and how misinformation was presented, spread and countered on digital platforms. Various social media platforms, such as Twitter, Facebook, YouTube, Reddit, Telegram and WhatsApp were studied, as well as the so-called dark platforms, such as 8kun and Gab. Several conspiracy narratives were also examined and discussed (e.g. 5G, hydroxychloroquine, Bill Gates, *plandemic*). Studies also discussed science trust and the role of social media in the public exchange of information.

Articles covered a diverse range of topics of COVID's impact on society. People's reactions and emotions related to the pandemic and isolation were studied and so were the pandemic's impact on communicating, dating and activities. Discrimination and inequalities during the pandemic were also widely researched. COVID-induced racism against Asians was a particularly studied topic, but also discrimination against other races, gender and age were noted.

Mistakes in assigning journals and authors to disciplines in the Scopus database have already been pointed out [13, 154, 155]. In the years 2020–2022 "Vehicular Communications" was listed in the first 50 in the ranking for communication studies. According to the journal's website, its scope is "communications between vehicles and including roadside communication infrastructure". While roadside safety and vehicular infrastructure are undoubtedly important issues in everyday life, it may raise questions about whether communication between devices should be compared and should compete with communication between people in the same scholar ranking.

6 Conclusion

In this review paper, we aimed to examine COVID-related communication research from a perspective of accessibility, methodology, network collaboration and main findings. Our study revealed journals with the highest number of publications on the subject and the general increase in COVID-related science production, although smaller than in medical sciences. Further, we tackled the issue of open access publishing, which is not often addressed in bibliometric studies. We

hope to have shown the significance of open access policy. Each studied article's research approach was labeled. Through the analysis of these indicators, it is possible to summarize the methodological trends in communication research related to COVID, which is crucial for future development of the field. Our social network analysis reveals that in communication studies there are problems of division into core and periphery in knowledge production, known from science in general. Underrepresented countries and institutions are less influential in research networks resulting in a snowball effect of underrepresentation. Our qualitative summary of main findings and most studied topics outlines the current state of knowledge about COVID within the communication studies.

6.1 Theoretical and practical implications

This study delineates the intellectual framework of COVID-19 research within the realm of communication studies, as documented in top-tier journals. It provides academics with a comprehensive understanding of the diverse methods shaping COVID research as an interdisciplinary field. Consequently, researchers can identify research gaps and emerging frontiers. Additionally, our findings facilitate the identification of valuable journals and collaborations. This work also serves as a valuable source of summarized insights, which enables researchers to deepen their knowledge of current literature and explore COVID-related topics more thoroughly.

Practitioners may use this study to prepare education programs, both using articles we have summarized or stressing the other issues, which communication studies has not yet explored. Results regarding trends in methodology can be used to educate future researchers, e.g. doctoral students, to be aware of the growing methodological gap and not shy away from qualitative research. Our results indicate two expanding gaps: one in methodological approaches and the other in international cooperation. These findings can assist universities and research funders in their efforts to address these disparities. The declining number of qualitative studies exacerbates the issue, as conducting comparative studies and replicating research procedures becomes increasingly challenging, particularly given the significant advantage of publishing these studies in restricted access journals. Additionally, administrative difficulties that hinder cooperation with countries in the Global South further widen the differences. Ensuring unbiased financing for such collaborations will facilitate the transfer of know-how to underrepresented institutions and countries, resulting in greater diversity and enrichment of scientific research.

7 Limitations and further research

Our results revealed the low accessibility level of qualitative studies. Further research in this area is recommended, as the growth of the gap between qualitative and quantitative studies was observed each year. Better accessibility of quantitative studies may encourage expanding and repeating of those studies, and thus the inaccessibility of qualitative studies may cause widening the already growing gap.

This study provided a qualitative summary of studied articles findings. However, while most represented themes are a valuable source of current research trends, there is also need to pay attention to more unusual scopes and perspectives. Case study approach underlines the value of so-called unique cases [156]. Future research could focus on less popular subjects regarding COVID among communication studies, to provide useful insights about the current condition of the field.

Despite every effort made to ensure research reliability and methodological precision, this study is not without limitations. As the literature review, this study was limited by the journals sampling and keywords employed. As we have examined and screened a large number of publications (6592), there are possible human errors in screening and coding.

We only relied on full length articles published in regular or special issues, without short texts and online first positions, which could deprive the sample of valuable manuscripts. A different approach to sampling, e.g. focused on best cited articles, would bring different results. We encourage future researchers to apply different approaches to sampling.

The study was also limited by the research paper format. Not all data collected could be presented in the article, and was placed in the supplementary materials. Future studies could compare this data with other reviews' results or repeat our study in a few years to compare the variability of research trends over time.

The basic unit of the study was a single article. Focusing on authors, institutions or journals could bring valuable insights in the future.

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Declarations

Competing interests The authors declare no competing interests.

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